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SOME GEOLOGIC ASPECTS OF CONSERVATION.

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Iowa is usually considered as primarily a prairie state, one whose chief aesthetic attraction lies in the satisfaction that accompanies the outlook over wide spreading grain field or level plain stretching away beyond the farthest ken. In a general way this is true and it is the fundamental factor in Iowa's agricultural supremacy. But it is equally true that within the limits of the state there are many spots and localities which for unique interest or quiet beauty or stately grandeur can scarcely be excelled within the Mississippi Valley. Since these are essentially geologic phenomena it is my purpose to discuss a few of them from the standpoint of the geologist.

Unquestionably the most attractive region in this state is "The Switzerland of Iowa," so named by the late Professor Calvin, formerly State Geologist of Iowa, because its picturesque hills and deep cut valleys with their winding streams make of it a land comparable with the "Playground of Europe." No one can traverse this region or view its bold front from the surface of the great river which flows along its eastern margin without being impressed first of all with its ever varying charm and then—if he will but pause and consider—with the marvelous history which has made possible such a beauty-spot in the midst of the boundless plains of the Mississippi Valley.

The Switzerland of Iowa includes Allamakee county and portions of Winneshiek, Clayton, Fayette, Dubuque and Delaware counties, while similar phenomena, though on a diminishing scale, may be found to the south along the Mississippi and its tributaries. Geologically it is the oldest part of Iowa, if we make exception of a very small area in the northwestern corner of the state, where the rock is older, though the final emergence from the sea may have been much more recent. Therefore the series of events which is recorded in the rocks exposed in this region is longer and more varied than that comprised in any other area of similar size in the state. It extends from the deposition of the later Cambrian sandstones through the varying condi-

tions of the Ordovician, the Silurian and the Devonian periods with their alternating limestones, sandstones and shales which bespeak changing relations of sea and land, or possibly arid climate, as is thought by some to be represented by the St. Peter sandstone. But what has given to this region its rugged charm is the erosion which has been ceaselessly at work for ages carving deep valleys into the once level plains, sculpturing the mas-

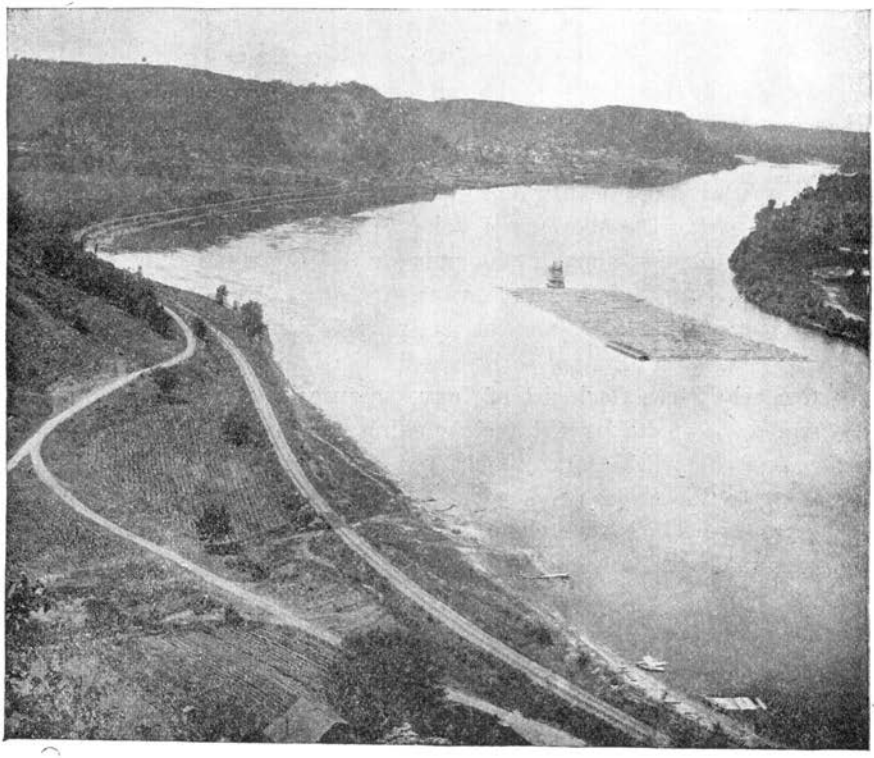


FIG. 7. Mississippi river south of Lansing, Allamakee county.

sive rocks into bold cliffs and battlemented towers, slowly, unobtrusively, irresistibly wearing away loose sand or solid ledge until the present picturesque topography has been developed.

This region lies in what is known as the Driftless Area, an area which has not been invaded by any of the great glaciers which covered the state, unless perhaps it was the first, the Nebraskan. Hence not only has the work of the erosive agents been uninterrupted but the region has not been subjected to the

destructive planing action of the great ice-sheet. So it is that the unique and beautiful forms resulting from the erosive work of air and water have been preserved under the most favorable circumstances. In the country immediately to the west, on the other hand, such erosion remnants have been swept away by the repeated advance of the ice, the river valleys have been filled and the resulting topography is a level or gently undulating prairie.

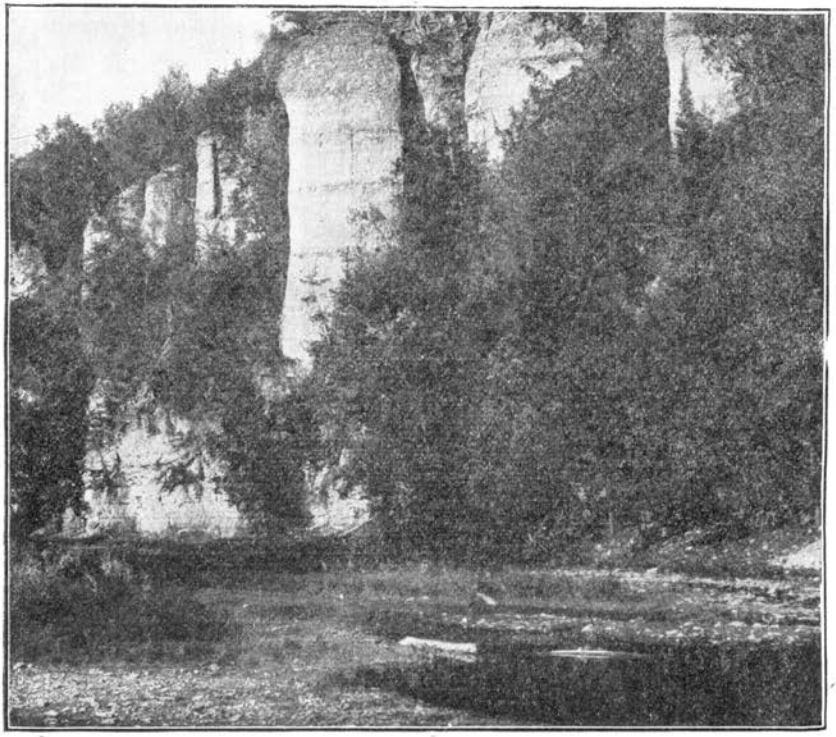


FIG. 8. Columnar cliffs along Oneota river, Winneshiek county.

One of the striking topographic features of northeastern Iowa, one which becomes apparent with a glance at the topographic maps of the region and is equally evident to the traveler, is the relatively straight course and smooth, parallel walls of the great gorge of the Mississippi, which is in marked contrast with the intrenched meanders and extremely irregular slopes of the tributary valleys. It is as if some gigantic plow had been forced down the main valley, cutting off all jutting headlands and leav-

the valley walls steep and rugged. And this is just what has happened. Great floods of water from the melting Wisconsin glacier, laden with rock, sand and silt, poured down the valley, scoured both floor and walls and then filled the valley to the level of the highest terraces of the present day. The lateral valleys, however, and the back slopes of the main valley, which were not subjected to this scouring, have retained their older, normal erosion forms.

There are many spots of beauty in this scenic wonderland. Along Oneota river are the great columnar cliffs of Plymouth Rock, the vertical scarps at Bluffton, the Ice cave and Mill

Fig. 9. Waterfall at Devil's Den, Allamakee county.

Spring at Decorah, Elephant Bluff, the Owl's Head, Mount Hope and other hills of circumdenudation. The most unique of all these is the Ice Cave. This is a great gap left in the rock by the slipping out of a block of stone along the cliff face. The limestones of the region are honeycombed with fissures and into these the cold air of winter is drawn, to be forced out during the warm days of spring and summer. Coming into contact with the moisture-laden warm air of the cave this colder air causes a precipitation of the moisture along the inner wall of the cave and forms during the early summer months a coating of ice which sometimes becomes ten to twelve inches thick. Mill Spring is

a gushing stream of beautifully clear cold water which issues from a similar, though probably smaller, rock-encumbered cavern not far from the Ice Cave. In times past the stream from the spring built up a deposit of tufa at the mouth of the little ravine down which it flows. There are countless other beautiful springs in the region and indeed every valley and ravine is a dream of beauty with flowing stream and towering castellated walls clothed with the beautiful green of summer or the glowing colors of autumn.

FIG. 10. Islands and ponds in the Mississippi below McGregor.

In a land of universal charm a spot which stands out with especial clearness in the memory of the traveler is the region around McGregor and North McGregor, the region in which it is now proposed to establish a national park. Especially favored by lavish Nature as to river, rock and bluff its charm is never-ending and its quiet beauty makes an impress which lingers through the years. The Pictured Rocks, about a mile below McGregor, are an unusual phenomenon even in this land of the unusual. A hundred feet or more of St. Peter sandstone, stained with all the browns and reds and yellows and purples of the iron oxides, in contrast with the translucent white of the

pure sand, form cliffs and grottoes and nooks of marvelous colors and patterns, set off by groves and lanes of shady trees.

At Guttenberg and again at the mouth of Turkey river are high narrow ridges nearly a mile in length which separate the tributary valleys from the valley of the Mississippi. The Guttenberg ridge is over 200 feet high, with a gentle slope to the south, and the Turkey river ridge is nearly as high and termi-

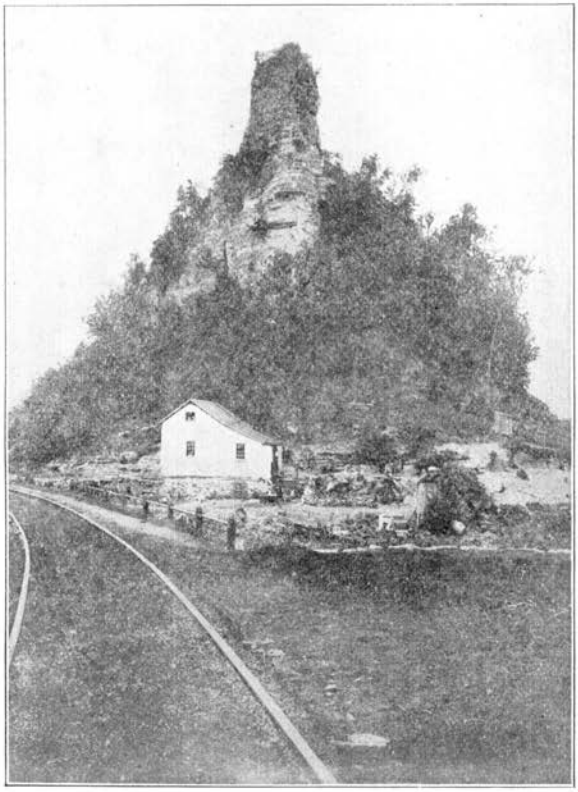


Fig. 11. Castle Rock at mouth of Turkey river, Clayton county.

nates in a bold rock tower which stands almost a hundred feet above the rivers on either side. These ridges of course owe their existence to the hard, resisting beds of rock which underlie the country and which withstand to the last the encroachments of time and the destroying elements.

And so one might continue this enumeration at great length, but it must be concluded with one or two more examples before

passing to other fields. It is well known that in the vicinity of Dubuque there are many caves, which have been formed by the solution of the limestones along cracks and fissures. Some of these have yielded beautiful specimens of stalactites and similar deposits, as well as great quantities of lead ore, and the caves themselves are interesting features. I well remember my disappointment a number of years ago on going through a cave in the City Railway's park to find that it had been absolutely stripped of all its wonderful stalactitic deposits and transformed into a bare, ugly, electric lighted tunnel. Its beauty was irredeemably gone. Such treatment is nothing short of stupid barbarism. Just west of Dubuque, too, are a number of fine examples of erosion pillars which have been carved out of the hard Galena dolomite. Some of these may be seen from the Illinois Central trains standing guard as lone outposts from the main body which has wasted away during the ages. Such remnants bear in themselves witness that no glacier has invaded the region during the long ages that they have been forming by the slow processes of erosion by the ordinary agents.

Another form of erosion remnant, most unique in a state like ours and of great interest anywhere, is the natural bridges of Jackson county. These are formed by the incomplete falling in of the roof of an underground drainage course, whereby portions are left still spanning the now open valley. They are located about six miles northwest of Maquoketa and together with a large cavern in the ravine they make a very popular resort for drives and picnics.

Outside of the more rugged area of northeastern Iowa there are, of course, many isolated spots of great beauty and charm which are well deserving of the nature lover's attention. Among these may be mentioned the Devil's Backbone, near the northwest corner of Delaware county, various localities along the Maquoketa and Wapsipinicon rivers, the Palisades of the Cedar, near Mount Vernon, Devil's Lane, near Muscatine, Indian Spring, near Burlington, and numerous others of equal interest and value. Entirely aside from their aesthetic value all of these areas are of importance to the geologist because of the illustrations of natural phenomena which they furnish, and for that reason as well as for others they are eminently worthy of care and preservation.

In the great central plains area of the state there are a number of very charming spots, which are all the more noteworthy because of their prairie surroundings. Such are the picturesque valleys of Willow and Lime creeks at Mason City, where the streams have cut the limestone bedrock into steep bluffs and precipices which now are margined and covered with forest growth. On a still larger scale is the gorge of Iowa river at Iowa Falls. Here the river has been displaced within recent geologic times and has been forced to cut a new channel through

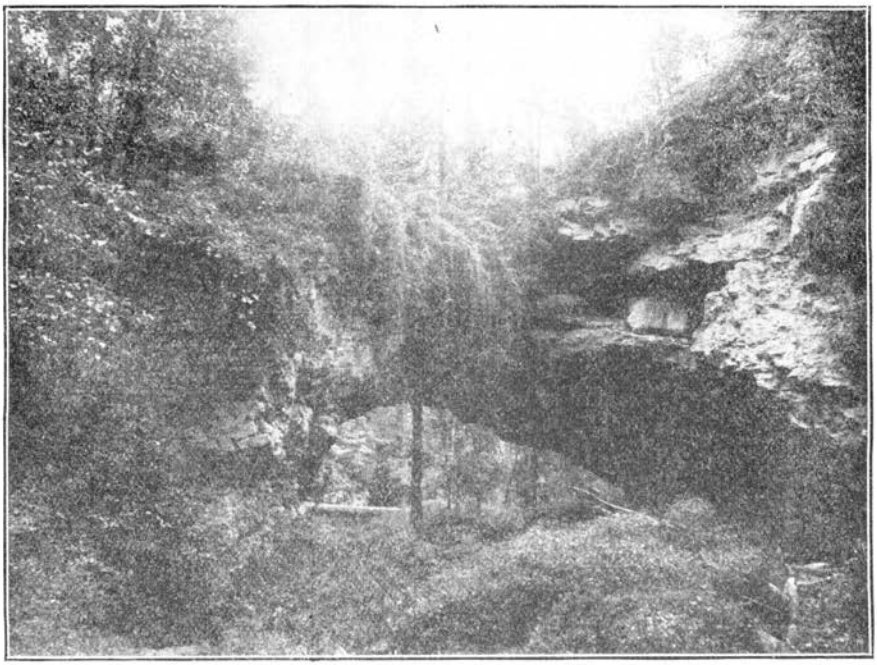
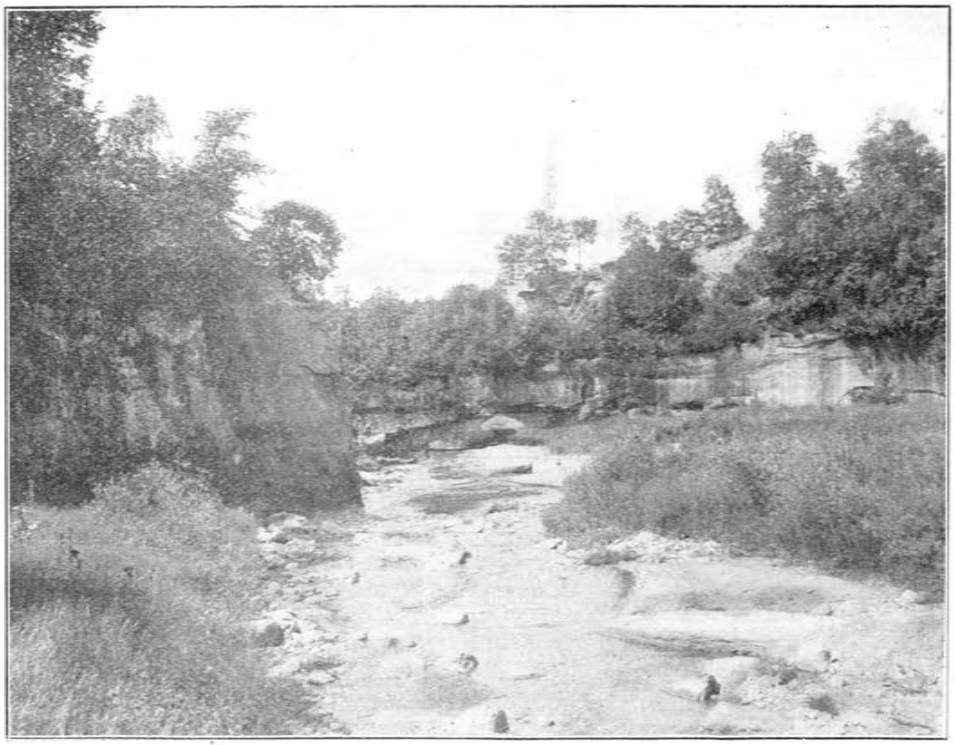


FIG. 12. Natural bridge in Jackson county.

seventy feet of solid limestone. Several small tributaries have had to undergo the same treatment and the result is a series of gorges and retreats which give the region a rare beauty and rugged charm. The older channel of the river is said to be still discernible to the south of the present one.

Steamboat Rock is another locality of geological and general interest and there are several others along the Iowa, such as the stretch above Iowa City, which owes its rugged character to the vagaries of glacial occupation. The older rocky hills were buried



The Ledges below Boone, Boone county.

with drift and when the river, whose location was determined by the topography of the glacial deposits, cut through these to the rock, it must perforce maintain its course and so was obliged to cut deeper and deeper into the massive limestones which lay athwart its path.

Along the Des Moines are many beautiful spots, as at Estherville, at Fort Dodge, the high bluffs above Boone, and the delightful "Ledges" below that city, the Red Rock bluffs at the

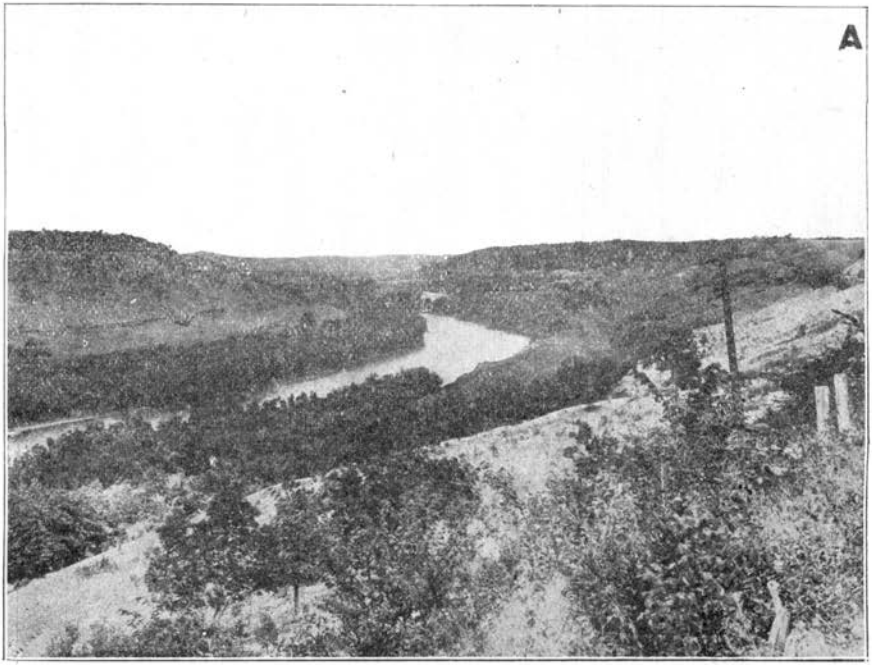


FIG. 12a. The gorge of Des Moines river between Boone and Fraser.

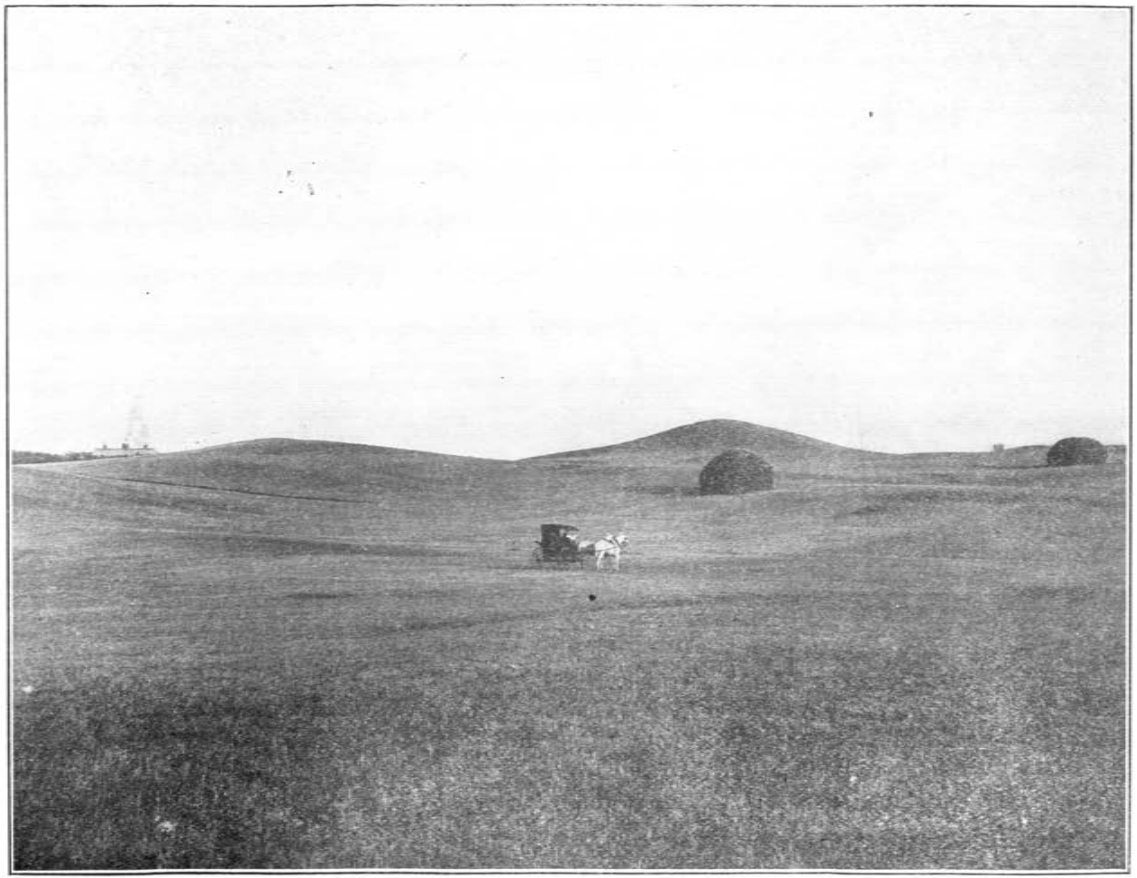
village of the same name, the charming bluffs at Cliffland below Ottumwa, and the numerous points of interest about Keosauqua. There is no spot in central Iowa which offers better natural facilities for a beautiful park than the area on either side of the river midway between Boone and Fraser. The entire two hundred feet of the valley's depth shows only glacial drift, and in places the slopes rise from the water's edge in a single sweep and are wooded from base to summit. Of an entirely different sort is "The Ledges." Solid sandstone walls rise sheer from the water and even overhang in places, a carpet of verdure covers the floor of the little valley, while trees rise to the summits of

the bluffs and form a setting for an exceedingly charming scene. The bluffs near Red Rock and Cliffland are also cut in sandstone of Coal Measures age and are of interest because of their geological history as well as for their natural beauty.

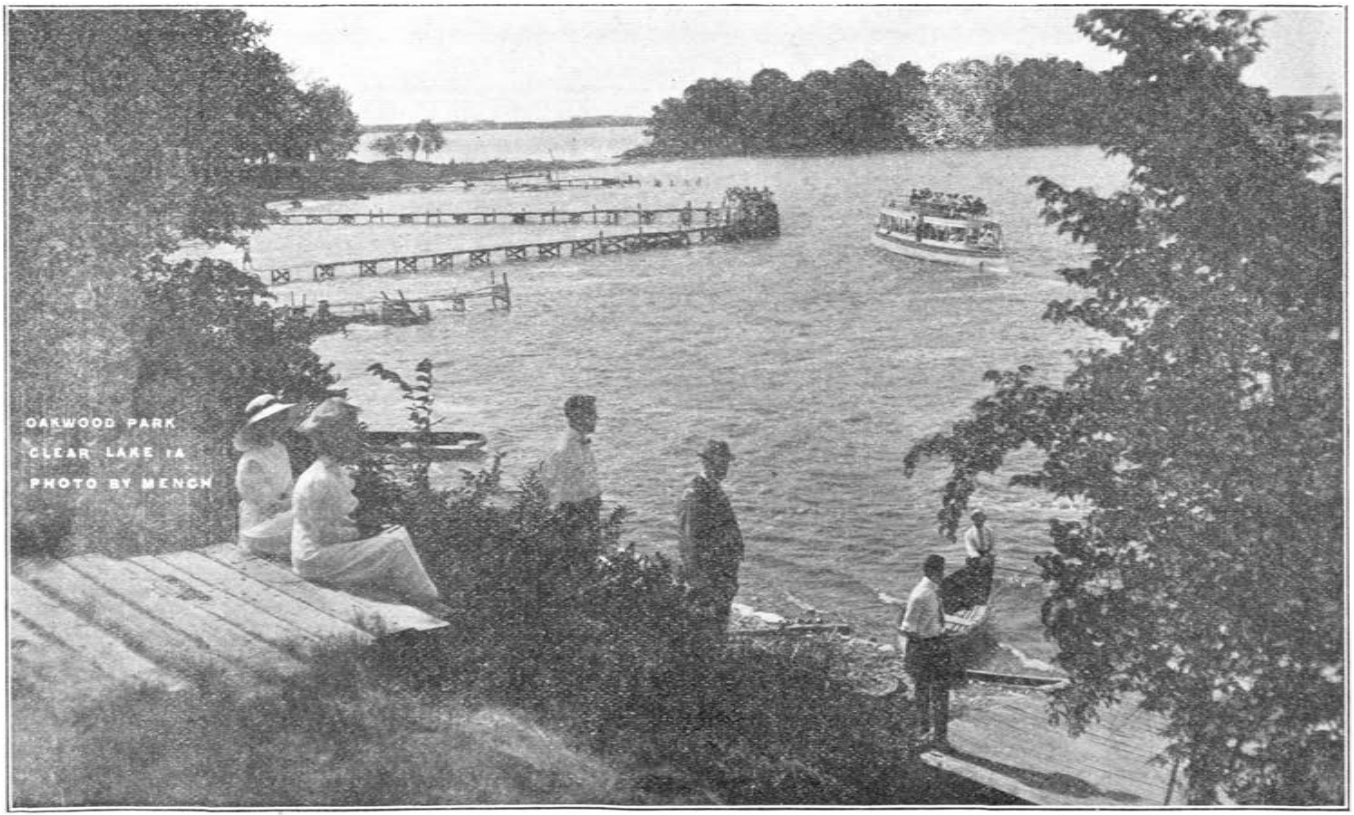
I have already spoken of the great ice-sheets and their glacial deposits as effacers of those types of topography which are due to erosion. It is partly because of this fact that the western two-thirds of Iowa has so few rock outcrops and hence relatively few spots of striking charm and beauty. Aside from a few

FIG. 12b. Pilot Knob, Hancock county. It rises three hundred feet above the creek near its base.

localities and these chiefly along the larger streams, the work of erosion since the retreat of the ice-sheets has been confined to the glacial drift deposits, which while easily eroded give rise to the softer, more subdued types of landscape. But there is a peculiar type of topography which is intimately associated with the depositional work of the last, the Wisconsin glacier, with the laying down of its load along its margin, and which consists of piled up mounds and intervening hollows, all without order or arrangement. This is known as the terminal moraine and along



Mountains of the prairie—the moraine in Wright county.



The island and docks at Oakwood, Clear Lake.

the eastern margin of the Wisconsin drift it is developed as far south as Hardin county, while on the western front it is conspicuous south to Carroll. An inner moraine, formed during the recession of the glacier, reaches intermittently in a broad loop from Winnebago county south into Boone and Greene and north again through Palo Alto and Emmet counties. While it differs markedly from the Driftless Area of northeastern Iowa this morainic area has many features of great charm. Its great mounds, many of them bare and gravelly, but some timber covered on their slopes or summits, the depressions among the hills, with an occasional lakelet nestling calmly in quiet beauty, all of these make an assemblage which can not fail to impress him who has eyes to see and a soul to appreciate Nature's handiwork. One of these great mounds, Ocheyedan Mound, in Osceola county, has long enjoyed the reputation of being the highest point in Iowa and while apparently it must yield precedence, at all events it is a landmark which is visible for miles around. Pilot Knob, in northern Hancock county, while not rising so high above the sea, rises twice as high above the plains about it as does Ocheyedan mound, and with its associated lakelet and timber groves is one of the charms of central Iowa.

The beautiful lakes of northcentral Iowa form another group of geologic features which are intimately associated both in distribution and in origin with these moraines, and which comprise one of the most attractive and valued types of Iowa's localities of natural interest. Everyone is drawn by the quiet beauty of a smooth-lying sheet of water set like a glistening diamond amidst low grassy shores or steeper wooded bluffs. And so it is that our lake regions appeal to all of us and we think of them and their popularity with justifiable pride.

A lake is one of the most evanescent and transient of natural phenomena. A stream may expand and increase its tributary area until it grows into a river; a mountain may, for a long time at least, keep pace in its growth with its decay: but the destiny of a lake, and especially of a glacial lake, is as inevitable and as easily foretold as the destiny of a man. And in comparison with the vast stretch of geologic time it is as short lived. For this reason it is all the more imperative that we do all in our power to conserve what lakes we have, to lengthen their lives so far as in us lies, to preserve for the coming generations these gems of beauty in our fields of emerald.

You are all familiar, by experience or by reputation, with the most important Iowa lakes and I need but to mention them to recall beautiful memories to your minds. In the eastern moraine Clear Lake is without a peer and indeed will bear comparison with any in all the lake region of the central United States. In the western moraine, which is much more extensive, the Okobojis and Spirit Lake hold easy pre-eminence, but a multitude of other smaller ones are held in warm regard by their local admirers, and certainly lack nothing but size to make them equally noteworthy. Storm Lake is deservedly popular among its circle of friends. Wall Lake has attained a wide reputation through its great wall of bowlders. The Twin Lakes of Calhoun county are centers of local attraction, and the same is true of many

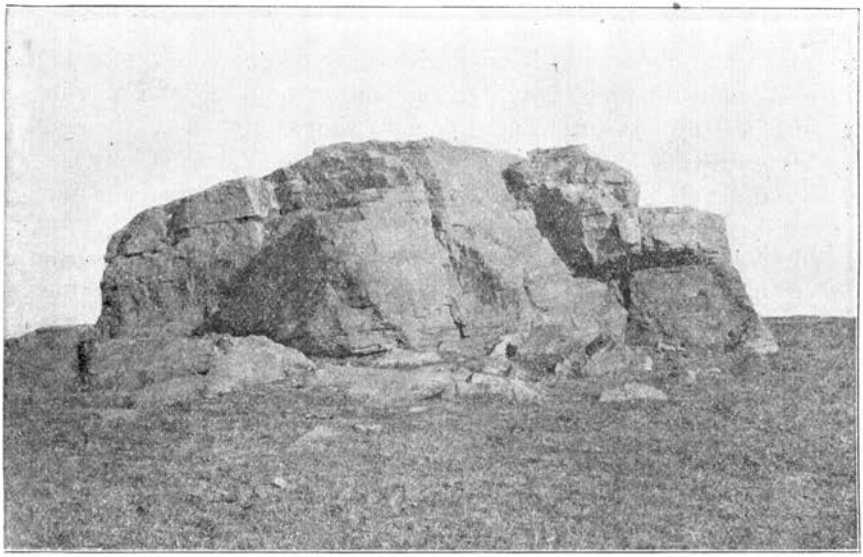
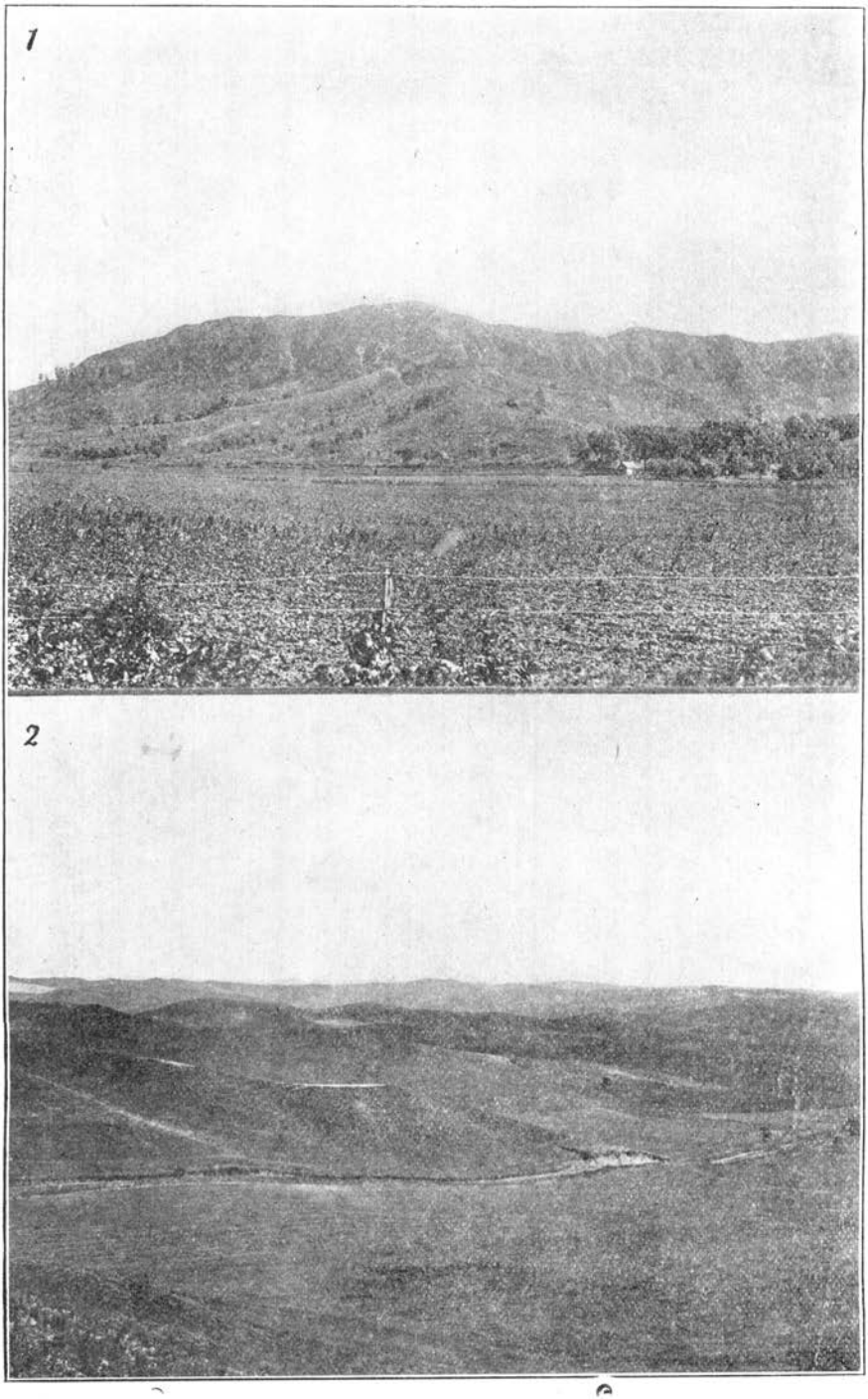


FIG. 13. Pilot Rock, Cherokee county.

others in the hill country which affords them lodgement, such as Tuttle Lake, on the state line in Emmet county, Medium Lake near Emmetsburg, Lost Island Lake near Ruthven, and others which will occur to your minds.

Along with their loads of finer material some of the continental glaciers brought down from farther north immense bowlders which now lie scattered over the surface of the drift sheets. Some of these have really enormous dimensions, as for example Pilot Rock, a bowlder of Sioux quartzite near Cherokee, which



Loess hills of Harrison county.

measures on the ground sixty by forty feet and rises above the surface twenty feet. The Iowan drift, in northeast Iowa, is especially noted for these monuments of bygone events and has more large bowlders than any of the other drift sheets in the state. Something should be done to preserve the most notable of these glacial bowlders in view of their unique origin and character. If nothing is done to prevent it they will ere long be sacrificed to the desires of their present owners for convenient building material and will be entirely lost to posterity.

Closely associated with the glacial deposits of the state and yet only partly related to them in origin is a remarkable formation known as the loess. In northeastern Iowa it is derived directly from the Iowan drift but along the western margin of the state it owes its origin to the great quantities of silt brought down and deposited by Missouri and Big Sioux rivers. From their flood plains it is picked up and carried away by the winds to be dropped over the clay hills in an ever-thinning mantle with increasing distance from the source. I do not recall that I have heard or seen these loess bluffs mentioned in conservation discussions, but there is no room for doubt that both botanists and geologists will agree in commending them for careful consideration. The fact that wind blown deposits with thicknesses of fifty to one hundred feet have been shaped into such striking topographic forms as are found along these bluffs, and the further fact that they bear what is in reality a desert type of vegetation, and this in the most fertile state in the world, are facts which entitle them to recognition in any plans for conservation of our beauty spots. The beautiful park at Council Bluffs with its winding valleys and steep slopes is sufficient witness to what is possible with these loess hills, but there should be preserved in an absolutely natural state a tract which would permit of the retention both of the original topographic forms and of their remarkable vegetal covering. Such areas are available near Missouri Valley, or near Turin, in Monona county, or in the vicinity of Sioux City, and at other localities where the phenomena are equally striking.

In the extreme northwest corner of Iowa, occupying an area of not over five acres is a little spot which is unique in its interest. This interest arises both because of its rock exposures, which are scores of miles distant from any others in Iowa, with the exception of a similar one a mile away, and because of the fact that

this rock is the oldest exposed stratum in the state. It is really the rock foundation upon which all subsequent formations are laid. This rock is the Sioux quartzite and the center of its interest is the natural depression perhaps twenty feet deep known as Jasper Pool. This represents the greatest thickness of the exposure in Iowa although on the Dakota side of the Big Sioux the rock has been quarried to much greater depths. It seems much to be desired that along with the natural bridges of Jack-

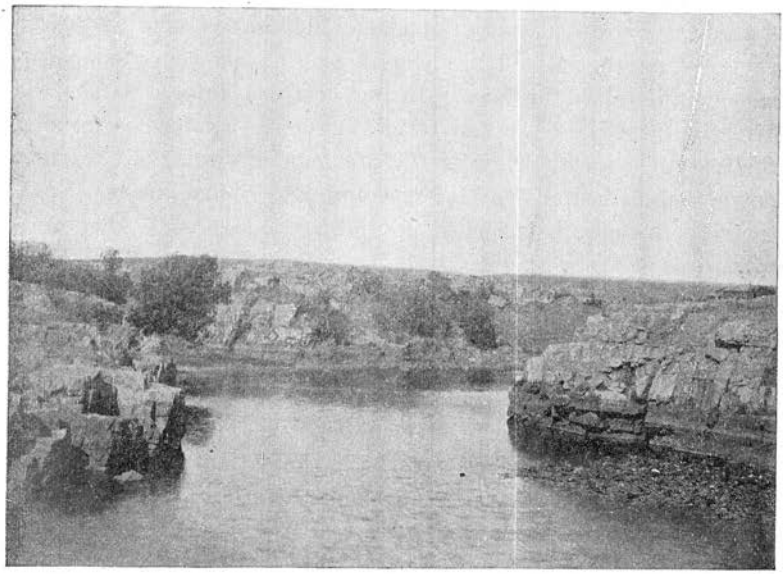


FIG. 14. Jasper Pool, Lyon county.

son county, the Waukon Sphinx, the great drift bowlders of the central plains, this little tract might be conserved as a state monument, and so with the larger phenomena in a series of state or national parks might make accessible to all posterity the evidence of the activity of geologic forces, past and present, and keep before our eyes the uplifting, broadening, educative beauties of the realms of Nature. Iowa has a group of beauty spots which she may well hold in esteem and to care for them and insure their perpetuation will increase the feeling of pride with which every Iowan regards his state and so will add in every way to the state's resources and attractiveness.

IOWA GEOLOGICAL SURVEY,
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